UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/600,991	06/19/2003	Dingding Chen	1391-20308	7123

46133 7590 03/09/2010
CONLEY ROSE, P.C.
David A. Rose
PO BOX 3267
HOUSTON, TX 77253-3267

EXAMINER	
BUSS, BENJAMIN J	

ART UNIT	PAPER NUMBER
2129	

MAIL DATE	DELIVERY MODE
03/09/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DINGDING CHEN, LUIS E. SAN MARTIN, GULAMABBAS A. MERCHANT, ROBERT W. STRICKLAND, and MARTIN T. HAGAN

Appeal 2008-004508
Application 10/600,991[1]
Technology Center 2100

Decided: March 9, 2010

Before JOSEPH L. DIXON, JEAN R. HOMERE, and THU A. DANG, *Administrative Patent Judges*.

HOMERE, *Administrative Patent Judge*.

DECISION ON APPEAL

---

[1] Filed on June 19, 2003. The real party in interest is Halliburton Energy Services, Inc. (Br. 3.)

I. STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) (2002) from the Examiner's final rejection of claims 1 through 3 and 5 through 9. (Ans. 2.)[2] Claims 10 through 25 have been allowed. (*Id.* at 2-3.) Claim 4 is objected to as being dependent upon a rejected based claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. (*Id.*) We have jurisdiction under 35 U.S.C. § 6(b) (2008).

We affirm.

Appellants' Invention

Appellants invented a method and apparatus for training a neural network to process signals from a logging tool into a representation of formation parameters. (Spec. 1, Para. [0002].) According to Appellants, the claimed invention selects and scales earth formation models based on the behavior of a particular well logging tool. (Spec. 12-13, Para. [0048].) Further, the claimed invention utilizes the respective earth formation models to train artificial neural networks ("ANNs") which provide good inversion of log data without geographical area limitation. (*Id.*)

Illustrative Claim

Independent claim 1 further illustrates the invention as follows:

> 1. Apparatus for converting output signals of a logging tool into a log representing a parameter of earth formations surrounding a borehole, comprising:
>
> an artificial neural network trained with a set of synthetic earth formation models selected to cover the

[2] All references to the Examiner's Answer are to the Examiner's Answer filed on June 29, 2007, which replaced the prior Examiner's Answer filed on May 9, 2007.

operating range of a selected logging tool based on sensitivity and resolution limits of the logging tool and based on realistic ranges of formation parameters.

Prior Art Relied Upon

The Examiner relies on the following prior art as evidence of unpatentability:

Anderson	3,954,006	May 4, 1976
Barber	5,184,079	Feb. 2, 1993
Mezzatesta	5,862,513	Jan. 19, 1999

Rejections on Appeal[3]

The Examiner rejects the claims on appeal as follows:

Claims 1 through 3 and 5 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Mezzatesta.

Claims 6 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Mezzatesta and Anderson.

Claims 7 and 8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Mezzatesta and Barber.

Appellants' Contentions

Appellants contend that Mezzatesta's disclosure of deriving a training set from well logging data amounts to a training set based on an actual formation. (Br. 9-10.) Therefore, Appellants argue that Mezzatesta's training set does not teach a training set "selected to cover the operating range of a selected logging tool," as recited in independent claim 1. (*Id.*) Further, Appellants allege that Mezzatesta's disclosure is directed to

[3] The Examiner withdrew the 35 U.S.C. § 101 rejection of claims 1 through 4, 10 through 12, and 20. (Ans. 3.)

utilizing trained neural networks, whereas the claimed invention utilizes data to train neural networks. (*Id.* at 10.) Additionally, Appellants argue that Mezzatesta's disclosure of generating synthetic models based on data from a particular tool in various earth formations does not teach a model that falls within the operation range of a logging tool, as claimed. (*Id.* at 11.)

Examiner's Findings and Conclusions

The Examiner finds that Mezzatesta's disclosure of obtaining raw data from a particular tool in actual formations in order to produce an input earth model that includes synthetic data teaches synthetically developing data for both an actual tool and formation. (Ans. 13.) In particular, the Examiner finds that Mezzatesta's input models include synthetically developed data specifically formulated for a particular tool and, further, based on realistic ranges of formation parameters. (*Id.*) Therefore, the Examiner finds that Mezzatesta's disclosure teaches input models that include synthetic data "selected to cover the operating range of a selected logging tool," as recited in independent claim 1. (*Id.* at 14.) Further, the Examiner finds that Mezzatesta's disclosure of introducing an input earth model to an ANN teaches training neural networks, as claimed. (*Id.*)

II. ISSUE

Have Appellants shown that the Examiner erred in finding that Mezzatesta anticipates independent claim 1? In particular, the issue turns on whether Mezzatesta teaches "an artificial neural network trained with a set of synthetic earth formation models selected to cover the operating range of a selected logging tool," as recited in independent claim 1.

III. FINDINGS OF FACT

The following Findings of Fact ("FF") are shown by a preponderance of the evidence.

Mezzatesta

1. Mezzatesta is generally related to well logging data interpretation systems and methods which use ANNs and, in particular, a system and method that is usable at a well site to predict well logging tool responses, unknown formation parameters, and reservoir descriptions. (Col. 1, ll. 20-25.)

2. Mezzatesta discloses utilizing "an ANN to receive an input earth model or models (based on real data actually acquired by a real tool) and output an appropriate tool response." (Col. 3, ll. 38-41.) "A separate ANN…is created for each type of well-logging tool. Each such ANN may have its own training dataset of well-log tool responses (these training datasets contain measured actual raw data for a real formation or synthetic responses derived based on such data)." (*Id.* at ll. 43-48.)

3. Mezzatesta discloses that "[a] well logging tool acquires data from a formation for an initial data set which is used to produce an earth model (which may be a group of models)…". (Col. 7, ll. 35-38.) "[B]ased on known raw data obtained by a particular tool in various actual formations, an input earth model is produced that includes synthetic rather than raw data." (*Id.* at ll. 38-41.)

IV. PRINCIPLES OF LAW

Anticipation

In rejecting claims under 35 U.S.C. § 102, "[a] single prior art reference that discloses, either expressly or inherently, each limitation of a claim invalidates that claim by anticipation." *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1375 (Fed. Cir. 2005) (citing *Minn. Mining & Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 1565 (Fed. Cir. 1992)).

> Anticipation of a patent claim requires a finding that the claim at issue "reads on" a prior art reference. In other words, if granting patent protection on the disputed claim would allow the patentee to exclude the public from practicing the prior art, then that claim is anticipated, regardless of whether it also covers subject matter not in the prior art.

Atlas Powder Co. v. IRECO, Inc., 190 F.3d 1342, 1346 (Fed Cir. 1999) (internal citations omitted).

Obviousness

"On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness." *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)) (citation omitted).

V. ANALYSIS

35 U.S.C. § 102(b) Rejection

Claim 1

Independent claim 1 recites, in relevant part, "an artificial neural network trained with a set of synthetic earth formation models selected to cover the operating range of a selected logging tool."

As detailed in the Findings of Fact section, Mezzatesta discloses utilizing an ANN to predict the responses of well logging tools. (FF 1.) In particular, Mezzatesta discloses training an ANN using one or more earth models that contain synthetic response data. (FF 2.) Further, Mezzatesta discloses deriving the synthetic response data from raw data obtained by a particular well logging tool in various formations. (FF 3.)

We find that Mezzatesta's disclosure of obtaining raw data by utilizing a well logging tool in a specific formation amounts to creating a range of synthetic response data particular to the operations of a well logging tool. Consequently, by utilizing a well logging tool in multiple formations to obtain raw data, Mezzatesta teaches creating synthetic response data for a wider range of the well logging tool's operations. We thus find that such a wider range reasonably approaches the limits of the operating range of a selected well logging tool. Thus, we find that Mezzatesta's cited disclosure teaches the disputed limitation. It follows that Appellants have not shown that the Examiner erred in finding that Mezzatesta anticipates independent claim 1.

Claims 2 and 3

Appellants do not provide separate arguments for patentability with respect to dependent claims 2 and 3. Therefore, we select independent claim

1 as representative of the cited claims. Consequently, Appellants have not shown error in the Examiner's rejection of dependent claims 2 and 3 for the reasons set forth in our discussion of independent claim 1. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2008).

Claim 5

Appellants contend that Mezzatesta's disclosure teaches the use of a neural network for forward modeling, whereas the claimed invention recites a neural network for direct inversion of tool logging signals. (Br. 12.) Therefore, Appellants argue that Mezzatesta does not teach "train[ing] an artificial neural network to generate representations of the formation models in response to the synthetic responses," as recited in independent claim 5. (*Id.*) We do not agree.

First, Appellants' assertion that Mezzatesta's disclosure teaches the use of a neural network for forward modeling, whereas the claimed invention recites a neural network with direct inversion of tool logging signals (*id*), is not commensurate with the scope of independent claim 5. Nowhere does independent claim 5 recite "a neural network with direct inversion of tool logging signals." Second, as set forth above, we find that Mezzatesta's disclosure teaches training an ANN by using one or more earth models containing synthetic response data. (FF 2.) In particular, we find that Mezzatesta's disclosure of training an ANN utilizing synthetic response data to produce one or more earth models amounts to "train[ing] an artificial neural network to generate representations of the formation models in response to the synthetic responses," as recited in independent claim 5. It follows that Appellants have not shown that the Examiner erred in finding that Mezzatesta anticipates independent claim 5.

35 U.S.C. § 103(a) Rejections

Claims 6 through 9

Appellants offer the same argument set forth in response to the anticipation rejection to rebut the obviousness rejection of claims 6 through 9. (Br. 14.) We have already addressed this argument in our discussion of claim 5 above, and we found it unpersuasive. Consequently, Appellants have not shown error in the Examiner's conclusion that: 1) claims 6 and 9 are unpatentable over the combination of Mezzatesta and Anderson; and 2) claims 7 and 8 are unpatentable over the combination of Mezzatesta and Barber.

VI. CONCLUSIONS OF LAW

Appellants have not shown that the Examiner erred in rejecting claims 1 through 3 and 5 as being anticipated under 35 U.S.C. § 102(b).

Appellants have not shown that the Examiner erred in rejecting claims 6 through 9 as being unpatentable under 35 U.S.C. § 103(a).

VII. DECISION

We affirm the Examiner's decision to reject claims 1 through 3 and 5 through 9.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

nhl

CONLEY ROSE, P.C.
David A. Rose
PO BOX 3267
HOUSTON, TX 77253-3267